

undulation.

There are needed a high-accuracy board and the leveling of the bumps, as exemplified by 10  $\mu\text{m}$  per IC chip (meaning that a thickness warp dimension accuracy of 10  $\mu\text{m}$  per IC chip is needed) in the first prior art, 2  $\mu\text{m}$  per IC chip in the second prior art, and 1  $\mu\text{m}$  per IC chip in the third prior art (bump height variation of not greater than  $\pm 1 \mu\text{m}$ ). In practice, a glass board represented by LCD is employed. In contrast to this, according to the present invention, the bonding is achieved while correcting the warp and undulation of the circuit board by deforming the same at the time of bonding. Therefore, a board of a degraded surface flatness including warp and undulation, exemplified by a resin board, a flexible board, a multilayer ceramic board, or the like, can be employed, and a less expensive versatile IC chip bonding method can be provided.

If the volume of the insulating resin located between the electronic component and the circuit board is set greater than the volume of the space between the electronic component and the circuit board, then the resin flows out of this space, producing the encapsulating effect. Therefore, it is not required to lay an encapsulation resin (underfill coat) under the IC chip after the bonding of the IC chip to the circuit board with the conductive adhesive,

which has been needed in the first prior art, and the process can be shortened.

By mixing the inorganic filler with the insulating resin by about 5 to 90 wt% of the insulating resin, the elastic modulus and the coefficient of thermal expansion of the insulating resin can be controlled to be optimum for the board. In addition to this, if this is utilized for the ordinary plating bump, then the inorganic filler enters the space between the bump and the circuit board, degrading the bonding reliability. However, if the stud bumps (forming method utilizing wire bonding) are employed as in the present invention, then the inorganic filler and also the insulating resin are forced outwardly of the bumps by the pointed bumps that enter the insulating resin at the beginning of the bonding. By this operation, the inorganic filler and the insulating resin are forced outwardly of the space between the bumps and the electrodes in the process of the deformation of the pointed bumps, and the unnecessary interposed object can be eliminated, allowing the reliability to be further improved.

When the inorganic filler of the same weight is mixed, by employing an inorganic filler that has a mean particle diameter of not smaller than 3  $\mu\text{m}$ , employing an inorganic filler that has a plurality of different mean particle diameters, employing inorganic fillers in which

the mean particle diameter of one inorganic filler is two times or more different from the mean particle diameter of the other inorganic filler, or employing at least two types of inorganic fillers in which one inorganic filler has a mean particle diameter exceeding 3  $\mu\text{m}$  and the other inorganic filler has a mean particle diameter of not greater than 3  $\mu\text{m}$ , the amount of moisture absorption to the periphery of the inorganic filler can be reduced to allow the moisture resistance to be improved and allow the amount of the inorganic filler to be increased, facilitating the film formation (solidification). Furthermore, the coefficient of linear expansion of the insulating resin layer of, for example, the resin sheet or the adhesive can be reduced, allowing the operating life to be increased, for the improvement in reliability.

Furthermore, if the one inorganic filler of the larger mean particle diameter is made of a material identical to the aforementioned insulating resin, then the stress alleviating effect can be produced. If the one inorganic filler of the larger mean particle diameter is made softer than the epoxy resin that serves as the insulating resin and the one inorganic filler is compressed, then the stress alleviating effect can also be produced.

Moreover, if the inorganic filler is not existing or reduced in amount in the bonding interface between the